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Applications of Chitinase in Agriculture and Waste Management

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Background: Protection of plants from disease produced by phytopathogenic fungi is one of the most important challenges in agriculture. Therefore, finding biological products that could be used for biological fighting is very important in agriculture. Chitinase is a glycosyl hydrolase that hydrolyses chitin. The use of chitinases as a bio-control agent is one of the attractive and environmentally safe strategy. Chitinous biomass can be converted into useful simpler components by utilizing chitinases minimizing water pollution.

Methods and Preliminary results: In this work, chitinase produced by *Bacillus cereus* GS02 was explored to find its utility in various biotechnological applications. The chitinase was tested for its antifungal activity by way of inhibition of the radial growth of *Fusarium oxysporum* and *Rhizoctonia solani*. The results indicated 45% and 46.6 % fungal inhibition for *Fusarium oxysporum* and *Rhizoctonia solani*, respectively. Further to check its potential in waste management, various chitinous wastes (prawn and shrimp shells) were collected, washed, autoclaved and incubated with chitinase, along with commercially available chitin flakes and powder. Degradation and production of hydrolysed products were compared by using colloidal chitin as a control. After the hydrolysis of chitin wastes by chitinase, HPLC analysis of hydrolysed products was done. It revealed that the products of chitin hydrolysis were eluted at ~3.1 minutes which is similar to that of commercially available N-acetylglucosamine (GlcNAc).

Preliminary conclusion: The present enzyme showed antifungal activity against two phytopathogenic fungi namely *Fusarium oxysporum* and *Rhizoctonia solani*. Therefore, the present enzyme has high potential in agriculture for controlling phytopathogenic fungi. The chitinase was efficient in degradation of chitinous waste, producing low molecular weight industrially important N-acetylglucosamine (yield- 34 mg/ml). The present enzyme has good potential for the management of chitinous wastes by converting them into useful products. These properties may generate interest as its uses in various pharmaceutical and medical fields.